THE MALAWI NATIONAL EXAMINATIONS BOARD

2024 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

CHIEF EXAMINER'S REPORT

AGRICULTURE (M012/I & II)

General Comments On:

A. Quality of the Paper

Paper I (Theory)

The 2024 Agriculture paper I compared well with the previous papers. The whole syllabus was sampled adequately and all the five core elements were covered. It tested all the skills. The language was suitable for MSCE candidates. It tested all levels of Bloom's Taxonomy, that is, from knowledge to application. The paper had no errors and the diagrams were clear.

Paper II (Practical)

The 2024 Agriculture paper II compared well with the previous year's papers. The whole syllabus was sampled adequately. It tested a variety of skills and abilities like observation, reasoning, drawing of figures, drawing conclusions and drawing diagrams. The language was suitable for MSCE candidates. It tested all levels of Bloom's Taxonomy, that is, from knowledge to application.

B. Performance of Candidates

Paper I

The general performance of candidates was below average. Majority of the candidates scored below 50 marks. Almost all candidates scored very well on recall questions. However, a few candidates were able to adequately respond to comprehension and application questions. Candidates who performed well demonstrated mastery of skills in Agriculture. They were able to construct grammatically correct sentences in their responses.

On the other hand those who performed poorly had problems in English and they failed to write correct spellings of the technical terms as demanded by the questions. The poor performance could also be attributed to failure by candidates to understand English and inadequate coverage of the syllabus by teachers. In other cases, candidates lost marks because they were responding not in line with demands of the questions.

Paper II

The general performance of candidates was above average. Majority of the candidates scored between 10 and 25 marks.

Candidates who performed well demonstrated mastery of skills in Agriculture. They were able to construct grammatically correct sentences in their responses. The good performance could be attributed to the long academic calendar which enabled teachers to cover the whole syllabus. Being a practical paper, the test items had a wide range of responses enabling candidates to get marks in different areas.

On the other hand those who performed poorly had problems in expressing themselves in English and some failed to write correct spellings of the technical terms as demanded by the questions. The poor performance could also be attributed to lack of experience in practicals as demonstrated by responses by candidates. In other cases, candidates lost marks because they were responding not in line with demands of the questions.

C. Performance of Candidates on Individual Questions

PAPER I

There were a lot of variations in terms of performance on individual questions.

Section A

Question 1 a

The question asked candidates to mention any two types of farm machinery. Most candidates got it right. The expected responses included human drawn machines, tractor drawn machines and animal drawn machines among others. Those who failed gave

examples of each category of the farm machinery such us ridgers, hoes etc. and some gave sources of power such as man power and engine power.

Question 1 b

The question demanded candidates to state two forms of soil degradation. Most of the candidates answered the question well. The expected correct responses included any of the following; physical, chemical and biological soil degradation. Those who failed gave the following wrong responses; human, natural, and mechanical degradation.

Question 1 c

The question asked candidates to explain any two limitations of bush fallowing as a cropping system. Most of the candidates performed poorly. The expected correct responses included the following; it requires a lot of land for one part of it to be left to fallow, it encourages deforestation as one bush is cleared after another, it increases the rate of soil erosion through clearing of the land which leaves the soil bare. Those who failed gave wrong responses such as; it requires a lot of skills, it is expensive, it improves soil fertility and it prevents diseases. Others lost marks because of just mentioning the limitation without any explanation.

Question 2 a

The question asked candidates to mention any two activities which are carried out when coming up with a complete budget. The question was popular but majority of the candidates answered it wrongly. The expected correct responses included; estimating income, planning how resources are used and calculating gross margin. Those who failed gave wrong responses such as; uses of complete budget, reasons for preparing partial budget and others were mentioning economic principles of farm business management.

Question 2 b (i)

The question asked candidates to mention a month in 2024 in which a kid would be ready for mating. The candidates were given information on a date a nanny gave birth to a male kid (1st June, 2023). Most candidates who attempted the question got it right. The correct response was the month of March. Those who failed gave wrong responses such as September, October, November and June, 2024.

Question 2 b (ii)

The question demanded candidates to give a reason for the answer given in 2b (i). Many candidates answered the question wrongly, they failed to give a correct reason. The correct response was a male kid (billy) takes 9 months to reach puberty which falls in March 2024. Those who failed gave wrong responses such as a kid reaches puberty after 1 and half years, billy matures after 3 months, gestation period is after 180 days, nanny delivers after 150 days. The responses showed that many candidates did not understand the question as it required application of the learnt knowledge.

Question 2 c

The question asked candidates to describe any one way in which crop rotation control pests in crops. A few candidates got all the two marks. Those who lost a mark was due to incomplete responses. The correct response was breaking the life cycle of the pests since their preferable host is replaced by a resistant host crop. Those who completely failed gave wrong responses such as spraying chemicals, improve soil structure, growing crops in different plots by changing the sequence each year and leguminous plants should be alternated with non-leguminous plants.

Question 3 a

The question demanded candidates to state two reasons for culling in goat production. Most candidates attempted the question but a few got it right. The expected correct responses included; when they produce low quality products, when they are sickly, when goats do not gain weight as expected, to reduce overstocking amongst others.

Those who failed interpreted culling as castration and some understood it as docking hence gave reasons for castration and importance of docking such as easy to mate, goat becomes docile and fatten quickly.

Question 3 b (i)

The question asked candidates to identify a mango disease on a given mango fruit which was labeled figure 1. Most candidates got it right. The correct response was Anthracnose or blossom blight. Those who failed gave wrong responses such as mango flies, mango spot, mango scales mango stone weevil, Powderly mildew, skin disease and anthrax

Question 3 b (ii)

The question asked candidates to name two ways of controlling the disease identified in question 3b (i). Most of the candidates performed well. The correct responses were; spraying copper fungicides/ benomil/mancozeb, planting resistant varieties, remove infected parts. The common wrong responses were; applying chemicals, applying manure/fertilizers, covering the infected fruit with net or plastic paper, vaccination, washing hands before eating and spraying carbaryl.

Question 3 c

The question asked candidates to describe any one aim of crop improvement. Most of the candidates performed well. The expected correct responses included the following; to increase the productivity of cultivated plants by developing better varieties with superior characteristics, increase quality by developing cultivated plants with better partition/ high disease resistance / better biomass among others. The common wrong responses included adding value, application of fertilizers, crop rotation, increase food security, selection and hybridisation.

Question 4 a

The question demanded candidates to describe one effect of the gender bias illustrated in given diagrams which were labeled figure 2 (farmers cultivating land using different technologies). A few candidates got it right. The correct responses were; the woman will not finish cultivating the field in time since she is using a hand hoe which is very slow hence low yield, the man will finish cultivating the field earlier since he is using a tractor which is fast hence high yield.

Most common wrong responses included discrimination against women, women using a hoe, lack of development, food security, poverty, A is using a hoe and B is using a machine and A does not know how to operate the machine.

Question 4 b

The question asked candidates to name the sources of power used in the illustration in question 4a. Most of the candidates got it right. The correct responses included; A – human power, man power. For B – mechanical power, machine power. Those who failed gave wrong responses such as ; A – woman power, animal power, individual power, hoe energy power. For B- fuel power, mechanising power, tractor power, biogas power and machinery power.

Question 4 c

The question asked candidates to describe any two limitations of the source of power used in diagram A using the illustrations used in 4a. A few candidates got the question right. The expected correct responses included; amount of work depends on the health of the worker hence low output, availability may not be guaranteed since a human being may fall sick, difficult to estimate power output produced by each person especially where there are many people working on the farm amongst others. Those who failed gave wrong responses such as lack of capital to buy farm machinery, they are cheap to use, expensive to buy food, depends on food energy and no skills required. Others were comparing diagram A and B and yet others were stating advantages of diagram A.

Question 5 a

The question demanded candidates to state any two factors to consider when mechanizing a farm. Most candidates got it right. The correct responses included the following; size of the land / farm, topography/terrain, value of the crop enterprise, availability of spare parts and accessibility of the land. Those who failed gave wrong responses such as geographical position, land should be free from diseases, availability of water, type of machine and site selection.

Question 5 b

The question demanded candidates to explain any two factors to consider when choosing a site for mushroom production. Most of the candidates got it right. The correct responses were; availability of waste materials/substrate to be used as medium for growth, climatic conditions (warm/rainy and humid environment, availability of clean water, away from pit latrines amongst others. Those who failed gave wrong responses such as topography, incubation shade, dark place, well ventilated, easy to clean and fertility of the soil.

Question 6 a

The question demanded candidates to give any two principles that are followed when designing crop rotation. Many candidates did not attempt it hence a few candidates performed well. The expected correct responses included the following; alternate tap/deep rooted crops with fibrous/shallow rooted crops, alternate leguminous crops with non-leguminous crops, alternate heavy feeder crops with light feeder crops and crops affected by the same weeds and pests should not follow each other among others. Those who failed gave wrong responses such as deep rooted crops should be grown together with shallow rooted plants, deep rooted plants with shallow rooted plants, comparative advantage, substitution of inputs and opportunity cost.

Question 6 b

The question asked candidates to explain two reasons for not mostly using biogas as a source of fuel on the farm. Most of the candidates failed this question. The correct responses were; requires high level of skill to install, requires large quantities of raw materials which are not readily available, it is labour intensive hence expensive and it is limited to few operations hence less efficient and not user friendly because it produces smell. Those who failed gave wrong responses such as it is not environmental friendly, it is cheap, it causes global warming and it pollutes air.

Question 6 c

The question asked candidates to explain any one way in which use of heavy machinery would destroy soil structure. A few candidates got it right. The expected correct responses included; they loosen soil particles making them more friable, they loosen the soil particles making them prone to soil erosion, compacts soil particles leading to reduced aeration, soil

stick to machine during cultivation therefore taken away and compacts soil aggregates leading to reduced water infiltration. Those who failed gave the following wrong responses; heavy machinery destroy soil structure, tilling the land at constant depth creates a hard pan, it improves soil nutrients, it prevents soil erosion and machinery produces smoke hence destroying soil structure.

Question 7 a

The question demanded candidates to state any two economic principles in farm business decision making. Almost all the candidates got it right. The correct responses were; opportunity cost, comparative advantage, input substitution and diminishing marginal returns. Common wrong responses included cooperative advantage, demand and supply, enterprise combination, profitability, capital availability and how and where to produce.

Question 7 b (i)

The question demanded the candidates to identify foetus presentation using a diagram which was labeled figure 3 (position of a foetus in a uterus of a cow). A few candidates got it right. The correct response was breech. Most common wrong responses were; bloat, embryo, dead calf, abnormal foetus, bleach, dystocia, abnormal presentation and breach.

Question 7 b (ii)

The question required candidates to give two recommendations that should be given to a farmer who owns such a cow using the figure given in 7b (i). A few candidates performed well. The expected correct responses included the following; the cow should be assisted during birth, the cow should be culled, provide it with a balanced ration during the pregnancy (steaming up) and consulting veterinary services. The majority of the candidates failed because they gave wrong responses such as abortion, eliminating the foetus, isolate the cow from others, giving them enough food, visiting doctor and force labour.

Question 7 c

The question demanded candidates to explain any one way in which growth habit of pasture affect its seed rate. A few candidates performed well, it seemed that many candidates did not understand the question. Some of the correct responses were; species

with large vegetative growth should be sown at a lower seed rate in order to reduce shading. However, the common wrong responses were; fast growth, purity of the seed, broadcasting, drilling and seed germination.

Question 8 a

The question asked the candidates to state any two advantages of stall feeding in cattle production. Majority of the candidates performed well. The expected correct responses were; prevents trampling of herbage (grass), prevents selective feeding/grazing, prevents overgrazing, animals gain weight fast and it achieves 100% utilization of feed. Those who failed gave wrong responses such as; it grows well, it requires low labour, source of income, balanced diet and it provides energy.

Question 8 b

The question demanded candidates to state a month in which a farmer should service the cow as he plans to calve it in the month of December, 2024. The candidates were demanded to show the working. A few candidates got it right. The expected correct response was as follows; December 2024 = (12 – 9 months) = 3rd month, which is March 2024. The question required candidates to recall the gestation period of a cow, which is 9 months. Those who failed lost marks due to wrong calculations. Others drew a diagram of a cow and a bull mating. Other common wrong responses included 4 months, December + 9 months = September and others wrote January.

Question 8 c

The question asked candidates to describe any one way in which bloat occurs in ruminant animals. Most candidates did not attempt this question. Those who attempted it, a few got it right. The expected answers were; due to rapid fermentation of young grass and legumes which leads to accumulation of gases in the rumen, over feeding resulting in indigestion, abrupt change in feeds given to animals resulting in indigestion and blockage of esophagus due to consumption of large food particles which results in indigestion. Those who failed, gave wrong responses such as; it has four chambers which show that they are ruminants, ruminants eat roughages which make them easy to digest, regurgitating the feed, feeding of roughages and taking food containing more salt.

Question 9 a

The question asked candidates to calculate the percentage change in demand for two products which were labeled X and Y using information which was given in a table.

A few candidates performed well. The correct responses were;

Produce X. % change in demand = 0.3 * 33% = 9.9%

Produce Y. % change in demand = 2.0*50% = 100%

Among those who failed, the common response were;

Produce X. 0.3/33 * 100 = 0.99

Produce Y. 2*50/100 = 1%

Question 9 b

The question asked candidates to identify a crop produce in question 9a which could give a high profit to the farmer. Most candidates got it right. The correct response was X. those who failed gave wrong responses such as Y, maize and tobacco.

Question 9 c

The question asked candidates to give a reason for the answer in 9b. The question was poorly performed by many candidates. The expected correct responses were; because a big change in price has led to a small change in demand thereby making a farmer to make more profit /more money, there is insignificant change in demand following a significant change in price. Those who failed gave wrong responses such as maize is a staple food which most farmers would buy for them to survive hence inelastic, Y has a greater percentage change in price than X.

Question 10 a

The question asked candidates to define the term ‘cation exchange capacity’. A few candidates got it right. The correct responses was ability of soil to hold and release cations. Those who failed was due to incomplete definition. The following are the most common wrong responses; the exchange of cation capacity, alkalinity and acidity of the soil and the exchange of hydrogen and hydroxyl ions.

Question 10 b

The question demanded candidates to mention any one way in which shelling and drying the grain of maize is important. Most of the candidates got it right. The expected correct responses were as follows:

(i) Shelling: speeds up drying, easy application of chemicals, easy transportation and takes up less storage space.

(ii) Drying: prevents rotting, avoids germination of grains, facilitates processing and reduces bulkiness.

Those who failed misinterpreted shelling with milling and others were defining the terms.

Question 10 c

The question asked candidates to explain any two ways in which processing of mushroom is important in ensuring food security. A few candidates got it right. The correct responses were; processed mushrooms will be available for a long time hence being available throughout the year, processed mushrooms will maintain quality during storage hence being available with the required nutrients, the mushroom will be available in different forms hence attractive to consumers, creates employment enabling people to get money to buy food and reduces losses during storage enabling more consumers access the mushroom. Common wrong responses which resulted in loss of marks included; source of food, source of income and source of medicine. Others wrote boiling and blanching which are methods of processing mushrooms.

Section B: Essays

Question 11

The question asked candidates to describe any five characteristics of Friesian cattle which make it suitable for milk production. A few candidates performed well in this question. The correct responses included; have large udders to produce more milk, have wide and well set hind quarters which give room for the large udders, have thin bodies which help to convert feed eaten to milk production, are docile which makes it easy to handle during milking, have large stomach which enables them to feed heavily for more milk production, have long lactating period to obtain more milk and have strong legs to support the udders. Those who failed gave wrong responses such as have good mothering ability, grows fast,

have good health, adaptable to harsh weather conditions, larger in size and have good genetic makeup. Some lost marks due wrong spellings such as ‘ada’ instead of ‘udder’.

Question 12

The question asked candidates to explain any five ways in which soil depth affect groundnuts production. A few candidates got all the marks for this question. The correct responses included the following; deep soils allow easy penetration of roots to absorb nutrients, deeper soils hold more water for groundnut growth, deeper soils have large volumes of air for root respiration, deeper soils have large volume of nutrients for groundnuts to grow fast, deeper soils provide greater room for microbial activity which decompose plant residues, deeper soils affect resistance to soil erosion thereby maintaining nutrients and deeper soils holds groundnuts plants firmly hence reducing lodging. Loss of marks by candidates was due to wrong responses such as it affects soil acidity, it affects soil workability, deep soils do not hold much water, shallow soils are good for groundnut production and deep soils reduce groundnut production as seeds fail to germinate.

Question 13

The question demanded candidates to explain five factors to be considered when selecting an agricultural enterprise combination. Majority of the candidates performed well on this question. The expected correct responses included the following; reliable supply of production inputs that will reduce production costs, social and cultural factors to avoid the problems of marketing outputs, availability of market as they determine the size of production, farmers’ food requirements to avoid starving and sufficient knowledge for proper management of the enterprise components among others. Those who failed gave wrong answers such as principles for the formation of agricultural cooperatives e.g. neutrality, honesty and open membership. Others gave economic principles of farm business management such as diminishing marginal returns and input substitution. Others lost marks because of repetition of points in different paragraphs.

PAPER II

Section A

Question 1 a

The question demanded candidates to describe the procedure that was followed when carrying out an experiment based on given results of a soil sample.

A few candidates got it right. The expected correct responses were; arrange / stack sieves according to mesh size with the sieve with largest holes on top, put a collecting tray underneath the sieve with smallest holes, put the soil sample on top of the sieve with largest holes, shake the sieves to collect the different sized soil particles, weigh the soil particles from each sieve.

Those who failed were describing other methods such as sedimentation method instead of sieving method. Lack of hands on activities in schools contributed to failure of candidates. This is reflected from candidates' responses.

Question 1 b

The question asked candidates to calculate percentage of soil particles in the soil sample. A few candidates got it right. The expected responses was to find total weight of the soil particles then use the figure to calculate percentage of the soil particles to obtain 10% for sand, 70% for clay and 20% for silt. Those who failed was due to poor numerical skills. Others lost marks because they failed to pick the right information from the table which could be used when finding soil particle percentages. Others were using soil diameter size of soil particles to find percentages. Some of those who picked the correct information failed to manipulate the figures to get the correct answer.

Question 1 c

The question demanded candidates to give a reason for not recommending the soil for maize production. A few candidates performed well on this question. The expected correct responses were; it has a high percentage of clay particles which holds a lot of water hence will suffocate the maize plant, it has more clay particles hence difficult for root penetration and development / difficult to cultivate, it is poorly drained due to high clay percentage hence prone to denitrification which will lead to yellowing of maize plants. Those who failed did not understand the question. Most of them did not answer based on the given information and the percentages they calculated. Analytical, interpretation and reasoning skills laced in most of the candidates.

Question 2

The question demanded candidates to describe a procedure that should be followed when processing mangoes into juice using canning method and to include any four materials that could be used. Most of the candidates performed well on this question. The expected responses included the following; materials to be used; ripe mangoes, sugar, lemon/vinegar, cans, sieve, blender/juice maker and containers. One of the correct procedure; wash the mangoes, peel the mangoes, slice/cut the flesh into pieces, squeeze/press/pulp the mangoes to extract the juice, add ingredients /sugar/lemon/vinegar, dilute to taste, put diluted mixture into cans and pasturelise/sterilize/heat the cans. Those who failed was because of the following reasons; not writing the steps in chronological order, some were writing as if it was an experiment question where they included observation, results and conclusion. Others were describing a procedure for making mango archar, some failed to come up with the correct procedure and others just listed the materials and started explaining the use of each materials missing the whole question.

Question 3 a

The question demanded candidates to identify the texture of a given soil sample after rubbing it between the thumb and fore finger. Almost all the candidates got this question right. The correct answer was coarse/gritty. However those who lost marks were mentioning the name of soil as sandy soil instead of its texture and others were mentioning the method used to identify the soil.

Question 3 b (i)

The question demanded candidates to identify the cropping system used when a farmer applied specimen Y (compost manure) to a maize garden. A few candidates got it right. The expected response was organic farming/biological farming/eco farming. Those who failed were identifying the specimen instead of the farming system.

Question 3 b (ii)

The question demanded candidates to explain importance of the cropping system identified in 3b (i).

A few candidates got it right. The expected correct responses included; prevents pollution of water hence good water for irrigation, protects useful insects hence high crop production, prevents contamination of food with chemicals hence prevent poisoning/death/loss of lives. Those who failed did not understand the question such that they were giving importance of compost manure instead of organic farming.

Question 3 c (i)

The question demanded candidates to record colour change of a blue litmus paper after mixing a soil sample given with water and then dipped a blue litmus paper.

Most candidates got it right. The expected correct response was the blue litmus paper changes colour to red/pink/orange/yellow. Those who failed lacked observation skills and they gave wrong responses such as no colour change and acidic colour.

Question 3 c (ii)

The question demanded candidates to record colour change of a blue litmus paper after adding lime to the mixture from question 3c (i).

Most candidates got it right. The expected correct response was the blue litmus paper will not change its colour/ will remain blue. Those who failed gave wrong responses such as blue black and colourless among others. Lack of observation skills was reflected from the responses.

Question 3 c (iii)

The question demanded candidates to give a reason for the observations on the colour changes of the blue litmus paper in 3c (i) and 3c (ii).

Most candidates got it right. The expected correct response was the blue litmus paper turned red in 3c (i) showing that specimen W (sandy soil) was acidic while when specimen X (lime) was added to the mixture, the blue litmus paper did not change its colour/ remained blue showing that the acidity in the specimen (clay soil) was neutralised. Those who failed was because they confused the colours e.g. red colour for base /alkaline and blue for acid which was vice versa.

Question 3 d

The question demanded candidates to name the chemical property of specimen W (sandy soil) which was being investigated.

A few candidates got it right. The expected correct response was soil pH /acidity or alkalinity. Those who failed gave wrong responses such as CEC, soil acidity and nutrient status.

Question 3 e

The question demanded candidates to explain one way in which application of specimen X (lime) would improve maize production.

A few candidates got it right. The expected correct response was the specimen neutralizes soil acidity thereby making more nutrients available for maize growth and development and also increasing microbial activities. Those who failed gave wrong responses which were true about the specimen X but not true based on the given experiment such as it improves soil structure and supplies calcium/magnesium which improves maize growth.

Question 4 a

The question demanded candidates to give two ways in which the activity (shelling) performed on specimen M (unshelled groundnuts) is important.

A few candidates got it right. The expected correct responses were reduces storage space, facilitates drying process, reduces transport costs, for easy selection of seeds, source of employment and increases market value. Those who failed gave wrong responses such as stating importance of the specimen (groundnuts) instead of the activity e.g. source of proteins, for body building, used for making cooking oil and for fixing nitrogen in the soil/adding soil fertility.

Question 4 b (i)

The question demanded candidates to name a method of crop improvement used when they had chosen seed from the shelled groundnuts.

Most candidates got it right. The expected correct response was selected/ artificial selection. Those who failed gave wrong responses such as crop processing, sorting and natural selection.

Question 4 b (ii)

The question demanded candidates to state any two characteristics that had been used to choose the five seeds.

Most candidates got it right. The expected correct responses were plump/large seeds, whole/not broken/undamaged seeds, health/not diseased.

Those who failed gave wrong answers by just guessing such as high yielding resistant from diseases and resistant to drought.

Question 4 c (i)

The question demanded candidates to name a method of seed treatment used on a given specimen (pasture seed) when they used sand paper to rub the pasture seed.

Most candidates got it right. The expected correct response was scarification. Those who failed gave wrong terminologies such as hulling, scratching, rubbing and dehusking.

Question 4 c (ii)

The question demanded candidates to describe the procedure they used during the seed treatment in 4c (i).

A few candidates got it right. The expected correct response was rub the seed using sand paper to scratch/chip off the hard seed coat. Those who failed used wrong terms such as the seed was crushed using sand paper, some wrote the seed was grinded and others described scarification but using hot water not sand paper which was given I the experiment.

Question 4 c (iii)

The question demanded candidates to explain the importance of the procedure carried out in 4 c (i).

Most candidates got it right. The expected correct response was it reduces the thickness of the seed coat/testa to facilitate water penetration into the seed for fast/quick seed germination. Those who failed gave wrong answers such as adds nutrients into the soil and to avoid pest attack.

C. Recommendations to:

(i) Schools

Schools should:

- encourage teachers to cover the syllabus adequately and thoroughly
- provide resources for practicals.
- encourage teachers to conduct practical lessons
- make sure that teachers use technical vocabulary when teaching
- train their students in good handwriting
- should conduct INSET for Agriculture teachers to share experiences.
- allocate Agriculture teachers to teach Agriculture

(ii) Ministry of Education

The Ministry should:

- provide adequate teaching and learning materials for practicals in schools
- allow teachers from privates schools to participate in INSET programs.

(iii) Malawi Institute of Education

- More charts should be produced showing different cropping systems and provide them to schools.
- Soil triangulation as a topic should be considered to be included in the curriculum to complete identification of soil texture.